THOMAS JEFFERSON AND SMALLPOX VACCINATION

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In this bicentennial year of the Republic probably none of the Founding Fathers has been quoted and discussed more than Thomas Jefferson who was born at Shadwell, Albemarle County, Virginia April 13, 1743. He has been honored as a patriot, statesman, politician, philosopher, inventor and architect, but his scientific contributions have received little attention. Nevertheless, his accomplishments in this field are varied and impressive.

Dumas Malone, the well known biographer of Jefferson, has written that what Jefferson seemed to enjoy most, with the exception of intimate family relationships, was the pursuit of knowledge, and he often "lamented that public affairs had taken him from the path of study and inquiry for which Nature really intended him." Abundant evidence supports Malone's statement that "He was interested in all varieties of learning, and every form of inquiry into Nature and its laws, and every invention or device that might contribute to human comfort and well being." He based his hopes for the progress and increased happiness of mankind on freedom and advancement of knowledge.[10]

Jefferson is probably best known as a scientist for his "Notes on Virginia" considered by many to be the first good treatise on topography, natural history and natural science written in one of the States.[9] A competent botanist, he listed the chief useful plants found in the state in the "Notes" and was the first to describe the pecan tree. His interests in botany and agriculture were lifelong. He was recognized as well versed in osteology and paleontology and he explored Indian mounds found along the Rivanna river. His curiosity, range of interest, and breadth of knowledge are also manifest in his correspondence with leaders in a number of fields. He wrote to von Humboldt on astronomy, de Buffon on the origin of the earth and the identity of the mammoth bones, to Robert Fulton about submarines, to Eli Whitney about the cotton gin, to Benjamin Rush about medicine, and many others. In 1797, the year of his election to the Vice-Presidency of the United States he followed Benjamin Franklin and Rittenhouse as President of the American Philosophical Society and considered it the "most flattering" incident of his life.[10] In 1802 he was elected a member of the Institute National de

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France, a country which also honored him by awarding him a gold medal for improvements on the wooden plow then in use.

Jefferson's contributions to medical science are even less well known. He did not hold in high regard the medicine practiced in his day, a point of view evident in his own writings and those of his physician, Dr. Robley Dunglison, who was also the first professor of medicine at the University of Virginia School of Medicine.

Dunglison has quoted Jefferson as follows:

"It is not to physic that I object so much as physicians".

"Time and experience as well as science are necessary to make a skilled physician, and nature is preferable to an unskilled one".

"Mr. Jefferson remarked that whenever he saw three physicians together he looked up to discover whether there was not a turkey buzzard in the neighborhood".[5]

Jefferson's skepticism of the state of medicine of that time was warranted. In his knowledge of the scientific method he was well ahead of the vast majority of the physicians of his day. Nevertheless, he demonstrated his faith in the scientific method and in the future of medicine when he included a medical school in the plans for the university which he founded.

During the eighteenth century much attention throughout the world was riveted on smallpox. Epidemics occurred throughout Europe and in 1754 accounted for one out of every ten deaths. In Boston there were thirteen epidemics between 1650 and 1800; in 1752 6,000 of the 16,000 inhabitants of the city contracted the disease. The morbidity rate has been said to be 25 per cent, the case fatality rate from 20 to 80 per cent.[8]

The collaborative effort made by Thomas Jefferson, the President and Dr. Benjamin Waterhouse, the Harvard professor, to study and promote vaccination against smallpox was a significant contribution to science and medicine of the day. It also affords an interesting insight into Jefferson's scientific bent and ability.

Dr. Benjamin Waterhouse, who was born in Newport, Rhode Island, in 1754 is generally recognized as the one who did most to introduce vaccination into the United States and promote its use. Educated in Europe, appointed a professor in the Harvard Medical School, he was promptly stimulated by Jenner's work and on March 16, 1799 published a report on the method and its effectiveness in a Boston Newspaper, "The Columbian Sentinel". On July 8, 1800 with matter sent by Dr. John Haygarth of Bath, England, he vaccinated his wife and children. He demonstrated great confidence in the method when he arranged with Dr. Aspenwall, physician of the smallpox hospital, to have some of his family tested for immunity to smallpox by infection with variolous matter and by exposure to patients with smallpox. Those challenged in

this way proved to be immune and Dr. Waterhouse observed "one fact in such cases is worth a thousand arguments". But this scientific accomplishment did not protect Waterhouse from argument and controversy.

Waterhouse's subsequent actions have received different interpretations. To some writers he was almost a martyr, a dedicated scientist and physician who tried to protect the public by insuring that vaccination was done properly, one who for his sense of duty was treated badly by jealous associates, the clergy, and the public.[7, 11] Others have seen a different Waterhouse, one who was an egocentric, vainglorious, contentious man, one who provoked enmity and distrust by his efforts at the outset to monopolize the vaccine material. Those of this persuasion thought he attempted to monopolize the vaccine for financial reasons, that he restricted its distribution to selected physicians who in return guaranteed him a percentage of their income from the procedure. When these accusations were made public, his enemies and detractors considered him evasive and less than candid in his replies.[1] Whatever the fair assessment of Waterhouse the man should be, his actions and writing at the time provoked a storm of controversy which was featured in the newspapers.

Soon after his successful vaccination of his own family Waterhouse for some reason decided to write to John Adams, President of the United States. In doing this he was not writing to a stranger who was the one in authority; instead he was writing to a powerful friend. He had stayed with the Adams family while studying in Europe.

Adams reacted in a way one might expect today. On September 10, 1800, he acknowledged the receipt of the treatise "Prospect of exterminating the Small Pox", said he had read it with pleasure, and would communicate it to the American Academy of Arts and Sciences. When Waterhouse heard nothing further he concluded that President Adams was not really interested; he next turned to Thomas Jefferson the Vice President, in the following letter dated December 1, 1800.[7]

> Sir,
>
> Having long regarded Mr. Jefferson as one of our most distinguished patriots & philosophers, I conceived that a work which had for its end the good of the community would not be unacceptable to him. – Under that impression I have here sent him "a prospect of exterminating the smallpox," and am with the utmost consideration and respect
>
> his very humble servant
> Benj Waterhouse.

Waterhouse's letter struck a responsive chord and Jefferson replied as follows:[7, 11]

Washing, Dec. 25, 1800.

Sir,

I received last night, and have read with great satisfaction, your pamphlet on the subject of the kine-pock, and pray you to accept my thanks for the communication of it.

I had before attended to your publications on the subject in the newspapers and took much interest in the result of the experiments you were making. Every friend of humanity must look with pleasure on this discovery, by which one evil more is withdrawn from the condition of man; and must contemplate the possibility, that future improvements and discoveries may still more and more lessen the catalogue of evils. In this line of proceeding you deserve well of your country; and I pray you accept my portion of the tribute due to you, and assurance of high consideration and respect, with which I am, Sir

Your most obedient, humble servant,
Thomas Jefferson.

Several things are noteworthy in this exchange of letters. Jefferson received the pamphlet on Christmas Eve, read it that night and wrote to Waterhouse the next day, Christmas Day. Jefferson's prompt reply and the wording of the letter reveal his enthusiasm; his previous knowledge of vaccination and of Waterhouse's work is also apparent.

Waterhouse, desirous of getting vaccination introduced to the South and knowing none of the physicians in that region, sent vaccine matter to Jefferson. Jefferson must have been disappointed when the vaccinations with the material received in June were unsuccessful. On July 28, 1801, he wrote as follows:[11]

Dear Sir

Your favor of the 17th arrived last night together with the new vaccine matter which was immediately sent to Doctor Gantt. The 2nd as well as the 1st supply of matter had failed. We hope the 3rd will be more successful. (It was not). How might it answer to put the matter into a phial of the smallest size, well corked and immersed in a larger one filled with water and well corked. It would be effectually preserved against the air, and I doubt whether the water would permit so great a degree of heat to penetrate to the inner phial as does when it is in the open air. It would get cool every night and shaded every day under the cover of the stage, it might perhaps succeed.----------

It will be a great service indeed rendered to humanity to take off from the catalogue of its evils so great a one as the small pox. I

know of no one discovery in medicine equally valuable. Accept assurance of my great esteem and respect.

Thomas Jefferson.

P. S. I re-enclose Dr. Lettson's treatise.

This letter shows that Jefferson's reaction when faced with the dilemma of the inert vaccine was that of a scientist. Disappointed but not discouraged, he turned his attention to the problem. He formulated the hypothesis that heat or drying encountered in transit might have rendered the active principle in the "vaccine matter" inert. He then designed an experiment to test his hypothesis; he suggested that the active matter be placed in a simple insulating medium before it was shipped. Vaccine sent in this way was the first to prove effective. Jefferson's hypothesis was verified. He had found an explanation for the failure of the vaccinations in Washington and also a way to remedy the difficulty. In the letter Jefferson again voiced his optimism regarding what vaccination could accomplish as a public health measure.

On August 21, Jefferson wrote from Monticello that a number of inoculations including 20 in his own family had succeeded. Jefferson at first called a physician in the neighborhood, Dr. Wardlaw, in to make the inoculations, but he soon announced he was too busy to assist and Jefferson carried on alone.[2] In September Waterhouse replied that the news of the successful vaccination had given him "Pleasure inexpressible"; he also wrote that he felt it no longer necessary to send vaccine matter from Boston, that the practice should be continued with the strain already established in Virginia.[7]

In August and September Jefferson sent material to Washington, Petersburg, Richmond, and other parts of the state, places where previous ineffectual vaccinations had left the people incredulous or skeptical about the success of the procedure.

On November 5, 1801, Jefferson wrote a letter to Dr. Coxe of Philadelphia and sent him the active material which he used to inaugurate vaccination in that city.

"In the course of July and August, I inoculated about seventy or eighty of my own family; my sons-in law, (Mr. Randolph and Mr. Eppes), about as many in theirs, and, including our neighbors who wished to avail themselves of the opportunity, our whole experiment extended to about two hundred persons. Only one case was attended with much fever and some delirium; and two or three sore arms which required common dressings. All these were from accidents too palpable to be ascribed to the simple disease. About one in five or six had slight feverish dispositions, and more perhaps had a

little headache, and more of them had swelling of the axillary glands, which in the case of adults disabled them from labor one, two or three days. Two or three only had from two to half a dozen pustules on the inoculated arm, and no where else, and all the rest only the single pustule where the matter was inserted, something less than a coffee-bean, depressed in the middle, fuller at the edges, and well defined. As far as my observation went, the most premature cases presented a pellucid liquor the sixth day, which continued in that form the sixth, seventh, and eighth days, when it began to thicken, appear yellowish, and to be environed with inflammation. The most tardy cases offered matter on the eighth day, which continued thin and limpid the eighth, ninth, and tenth days. Perceiving therefore that the most premature as well as the tardiest cases embraced the eighth day, I made that the constant day for taking matter for inoculation, say, eight times twenty-four hours from the hour of its previous insertion. In this way it failed to infect in not more I think than three or four out of the two hundred cases.

In my neighborhood we had no opportunity of obtaining Variolous matter, to try by that test the genuineness of our vaccine matter; nor can any be had, or Dr. Gantt would have tried it on some of those on whom the vaccination has been performed. We are very anxious to try this experiment, for the satisfaction of those here, and also those in the neighborhood of Monticello, from whom the matter having been transferred, the establishment of its genuineness here will satisfy them. I am, therefore, induced to ask the favor of you to send me in exchange, some fresh Variolous matter, so carefully taken and done up, as that we may rely on it; you are sensible of the dangerous security which a trial with effete matter might induce.----------

These I think are the most material of the observations I made in the limited experiment of my own family. In Aikin's book which I have, you will find a great deal more. I pray you to accept assurances of my esteem and respect.

(Signed) Thos. Jefferson.

This letter reveals Jefferson as an interested and competent clinical investigator. It is evident that he was a keen observer who carefully kept accurate records. He reported his personal experience to Dr. Coxe, gave him precise directions for vaccination, and related his reasons for them. Further, like Dr. Waterhouse, he felt the need to challenge some of the vaccinated subjects with variola virus as the only way to prove that he had not only successfully transmitted cowpox, but also had

actually conferred resistance to smallpox. The success of this experiment is reported to Dr. Waterhouse in the following letter:

Washington Dec 25, 1801.

Dear Sir,

I am indebted to you for several favors unacknowledged. I have waited till I could inform you that some variolous after vaccine inoculation had proved that I had preserved the matter of the cowpox in it's genuine form. Dr. Coxe of Philadelphia was ascertained this, having secured his vaccine matter from hence. To this is added your information that the matter I sent you produces the genuine disease and consequently those in Virginia who received the matter from me are now in security.----------

Jefferson's accomplishments in this field in the single year are indeed impressive. He had introduced smallpox vaccination into many places in Virginia as well as Washington and Philadelphia. He had devised a means of successfully shipping the vaccine. He had confirmed Waterhouse's earlier experiments that showed that the cowpox vaccine material used in the country was safe when properly used and that it provided effective protection against smallpox. Further, his experimental observations agreed with those of Jenner and Waterhouse that material obtained on the eighth day was most likely to be safe and potent. These accomplishments seem even more impressive when one realizes that it was the President of the country, then 58 years of age, who actually did much of the work himself.

Both the first and eighth letters that Jefferson wrote to Waterhouse were written on Christmas Day, which seems a little unusual. Perhaps an explanation is given by Malone who wrote of Jefferson as president, "No special festivities marked the Christmas season. Jefferson was largely oblivious of that, though his gifts to charity appear to have become greater as the season approached. The only festival day besides the Fourth of July that he recognized officially was New Years, when he held a levee."[10] Apparently Christmas Day was just another working day for Jefferson.

In subsequent years Jefferson continued to promote vaccination as a public health measure. During his first term when a sizeable group of American Indians, headed by Chief Little Turtle, visited him in Washington he greeted them with an address on the unexpected gift that had come from the Great Spirit to help insure the freedom from disease for all men. He then turned the delegation over to Dr. Gantt who vaccinated each one.[6]

Jefferson's planning and promotion of the Lewis and Clark expedition to the Northwest included scientific as well as economic and national

aspects. Jefferson arranged for his friend and former secretary, Meriwether Lewis, to study botany and zoology before beginning the trip. Jefferson included in the supplies of the expedition a quantity of vaccine material with instructions that the party vaccinate as many Indians as possible.[2]

During his second term as president, on May 14, 1806, Jefferson wrote to Dr. Edward Jenner:

> "You have erased from the calendar of human afflictions one of its greatest. Yours is the comfortable reflection that mankind can never forget that you have lived. Future nations will know by history only that the loathsome smallpox has existed and by you has been extirpated."[4]

Although it has perhaps taken longer than Jenner, Waterhouse and Jefferson thought, it appears that their dream has come true. Requirements for smallpox vaccination have been relaxed in recent years and just this summer, 175 years after the work of Waterhouse and Jefferson, the newspaper in Jefferson's hometown, the Charlottesville "Daily Progress", carried a story headed "SMALLPOX": Man's long battle against this disease may be over". The report came from the World Health Organization through the National Center for Disease Control in Atlanta. The methods that were utilized in this great accomplishment were the same employed by Waterhouse and Jefferson – isolation and vaccination.

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